





L2 (2.1) The Midpoint of a Line Segment

The midpoint of a line segment is the point halfway between the two endpoints.

Algebraically, we can consider the x-coordinates and y-coordinates separately, finding the halfway value for each.

L2(2.1)- Midpoint of a Line Segment

Algebraically, the halfway point between two values is their sum divided by two.

Given two points, (x_1, y_1) and (x_2, y_2) , we can write

$$x_{\text{midpoint}} = \frac{x_1 + x_2}{2} \quad y_{\text{midpoint}} = \frac{y_1 + y_2}{2}$$

In general, the midpoint formula is written

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Note that the midpoint is a point, expressed as (x, y) .

Ex.1: Determine the coordinates of the midpoint, M, of the line segment with endpoints A(-2, -3) and B(4, 7).

$$\begin{array}{l}
 P_1 \quad P_2 \\
 M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \\
 M = \left(\frac{-2 + 4}{2}, \frac{-3 + 7}{2} \right) \\
 M = (1, 2) \\
 \therefore \text{the midpoint is } (1, 2)
 \end{array}$$

Ex.2: One endpoint of a line segment is at (1,2) and has a midpoint of (5,5). What is the other endpoint?

$$\begin{array}{l}
 M_x = \frac{x_1 + x_2}{2} \quad M_y = \frac{y_1 + y_2}{2} \\
 2 \times 5 = \left(\frac{1 + x_2}{2} \right) \times 2 \quad 2 \times 5 = \left(\frac{2 + y_2}{2} \right) \times 2 \\
 10 = 1 + x_2 \quad 10 = 2 + y_2 \\
 10 - 1 = x_2 \quad 10 - 2 = y_2 \\
 x_2 = 9 \quad y_2 = 8 \\
 \therefore \text{the endpoint is } (9, 8)
 \end{array}$$

Assigned Work:

p. 78-80 # 2ac, 3, 4e, 5, 6, 8, 9, 11